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Genetically Modified Food: What Are Mainers Thinking?

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Whether to allow genetically modified (GM) foods in Maine, and if so, under what circumstances, has been hotly debated in recent years. In this article, the authors explore one aspect of the issue—Mainers' attitudes about the labeling of GM foods. They point out that labeling GM foods is more complex than simply whether to label. Policy decisions need to be made about whether labeling should be mandatory, what pieces of information should be on the label, who should be in charge of monitoring compliance, and even what foods should be labeled. The authors discuss the potential benefits of GM food labeling, and conclude that simply labeling foods as "genetically modified" would be of relatively little use since there would not be enough information for consumers to make informed decisions about what they buy. 🐙

The production and labeling of genetically modified (GM) foods has been controversial in Maine—debated at the legislative and judicial levels, and in the arena of public opinion. For example, the last three Maine legislatures have debated at least five different bills related to GM food production or labeling. Three of these bills have focused on GM food labeling and have died in committee. One bill, signed into law in June 2001, established that suppliers must provide written instructions on how to grow a GM crop so as to minimize the risk of cross-contamination and established liability when contamination does occur. The history of the most recent bill (LD 1219—121st session) provides an illustration of the level of controversy surrounding this issue; LD 1219 began as a bill to create a three-year moratorium on the planting of GM crops and ended as a bill to establish a working group to study the potential of marketing Maine food as GM-free. The bill died when the two houses of the Maine Legislature could not resolve differences between different versions of the bills.

Mainers also have been involved in the GM food debate at the judicial levels—both at home and in Washington. For example, genetic modification of aquacultured salmon in Maine has been debated and then banned by Portland's U.S. District Court (ELC 2002). In another case, Maine's attorney general recently rejected a request from Monsanto to suspend the use of the state of Maine quality trademark for milk and milk products and to bring enforcement proceedings against (allegedly) deceptive claims made by two Maine dairies. The attorney general rejected Monsanto's claims and, in turn, Monsanto has filed suit against Oakhurst Dairies. Finally, Maine farmers also have been involved in filing a lawsuit against the United States Environmental Protection Agency (EPA) to force it to withdraw approvals for crops that have been genetically modified to contain the *Bacillus thuringiensis* gene (Greenpeace 1999).

The research, use or sale of genetically modified crops also has resulted in education events, protests, and direct action in Maine. For example, the Peace and Justice Center of Eastern Maine holds an annual Safe Food Fair in Bangor (BDN 2000a) which, at least partially, focuses on increasing awareness of real and

hypothetical risks posed by GM foods. In addition, Greenpeace has protested against the sale of GM food at Maine supermarkets (AP 2002) and, using more aggressive tactics, a group called the "Seeds of Resistance" sabotaged a half-acre research plot of GM corn at the University of Maine (BDN 1999) and an unidentified group destroyed a four-acre stand of hybrid poplar trees (mistakenly thought to be genetically modified) owned by the MEAD Corp in Milo (BDN 2000b).

Whatever the arena, or the approach, the outcome of the GM food debate could dramatically alter the structure of Maine's agricultural and food retail industries. Until recently, individuals who have a vested interest (e.g., members of the biotech industry and organic farmers), along with a relatively small group of consumer and food activists, have largely driven the debate surrounding GM foods in Maine. Often the debate has centered on answering the question of whether GM foods should be allowed or, if allowed, whether they should be labeled. Although these are important primary questions, the labeling issue is more complex than simply determining whether to label. If GM food labeling is to occur, policymakers need to consider the form of the labeling program. Should it be mandatory or voluntary? What foods should be labeled? What pieces of information should be placed on the label? Who should be in charge of monitoring compliance? To answer these questions, policymakers in Maine will have to balance the concerns and desires of a broader spectrum of Maine residents than those who typically appear at legislative hearings. Here, we present an overview of a recent survey of Maine residents aimed at answering some of the above questions.



Whatever the arena, or the approach, the outcome of the GM food debate could dramatically alter the structure of Maine's agricultural and food retail industries.

THE UNIVERSITY OF MAINE STUDY

During the summer of 2002, we administered a mail survey to a random sample of 710 Maine adults. A total of 375 Maine residents responded to the survey, for a response rate of 53%. In general, our respondents are similar to the characteristics of the Maine adult population as measured by the recent U.S. Census.

Mainers' Awareness of GM Food Production

We asked a series of questions to determine Mainers' awareness and knowledge of current GM food production in the United States; the answers help provide context to the opinion questions presented later. We first asked Mainers if they had heard about GM foods; 76% of Mainers indicated they had heard of these foods. For those who had heard of these foods, we then provided them with a list of seven GM foods and asked them to indicate which of the foods they had heard about. Corn was the most known food, followed by tomatoes, salmon and potatoes (Table 1). The high awareness of corn may be due, in part, to extensive news coverage in 2000 of the contamination of taco shells by GM corn not approved for human consumption (STARLINK corn). The high awareness of tomatoes may be because the FLAVR SAVR™ tomato was the first commercially available GM food in the United States (released in 1994). It is likely that Mainers have a relatively high awareness of GM salmon and potatoes because of recent controversies about potential GM salmon use¹ by the Maine aquacul-

TABLE 1: **Percent of Mainers who had Heard of Specific Foods Being Genetically Modified**

| | |
|------------|-----|
| Corn | 77% |
| Tomatoes | 56% |
| Salmon | 32% |
| Potatoes | 25% |
| Soybeans | 22% |
| Canola Oil | 4% |
| Squash | 4% |

ture industry and earlier controversies about potential GM potato plantings in Maine.² It is somewhat surprising that Mainers do not have a higher awareness of GM soybeans, given that most soybeans grown in the United States are genetically modified.

We next asked Mainers to provide an estimate of the percent of food sold in the United States that is genetically modified. According to the U.S. Department of Agriculture (USDA), an increasing percentage of the corn (about 30% of plantings in 2001) and soybeans (about 70% of plantings in 2001) grown in the United States comes from genetically modified crops (Fernandez-Cornejo and McBride 2002). These crops are used to make commonly used food ingredients (e.g., high fructose corn syrup, corn starch, vegetable oils, textured vegetable protein). Goldsbrough (2000) states that the Grocery Manufacturers of America estimates that 70% of the foods on grocery store shelves contain GM ingredients. However, most Mainers (55%) perceive that less than 30% of the food supply had been genetically modified. Strikingly, less than 5% of Mainers thought the answer was more than 70%. Clearly, Mainers have an imperfect appreciation for the amount of GM foods they have been eating; this is probably due to the current lack of GM food labeling.

Mainers' Opinions About Food Production

We then asked Mainers to provide a concern rating for eight different food production and processing techniques. Surprisingly, Mainers' number one food production concern is not the use of genetically modified ingredients (Table 2). In fact, the use of GM ingredients is the third most important concern to Mainers; pesticide use and the use of artificial growth hormones rank higher. Perversely, the top four food production concerns of Mainers do not require a food to be labeled (nationally) whereas use of food production techniques that concern Mainers less do require some sort of labeling (nationally).³

The apparent discrepancy between individuals' concerns about different food production technologies and the labeling of foods using these technologies raises two interesting questions. The first is a policy question: If the Maine Legislature proceeds to imple-

ment a labeling requirement for GM foods, one may question why a similar requirement for pesticide and artificial growth hormone use is not imposed (or at least advocated for) since these latter two technologies are of higher concern to Mainers. The second is a research question: given that unlabeled technologies are those of highest concern, one may question if labeling, in fact, has the ability to reduce consumer concerns about food technologies. We will not attempt to answer this question here but will defer it until the next section.

TABLE 2: Mainers' Rankings of Concerns About Food Production and Processing Technologies*

| | |
|---|------|
| Use of pesticides | 4.12 |
| Use of artificial growth hormones | 4.06 |
| Use of genetically modified ingredients | 3.79 |
| Use of antibiotics | 3.65 |
| Use of irradiation | 3.53 |
| Use of artificial colors/flavors | 3.27 |
| Use of preservatives | 3.23 |
| Use of pasteurization | 2.70 |

* where 1= not at all concerned, 3=somewhat concerned, and 5=very concerned

Mainers' Views About GM Food Technology

The debate about GM foods has hinged partially on the potential benefits touted by supporters of these foods, while opponents highlight the potential risks. Often assertions are made as to what the concerns of Maine consumers are; or there are assertions as to the benefits that would accrue to consumers living in Maine. We feel that policy debates should not rest primarily on assertions of what individuals want, but should be based upon information obtained from Maine citizens. Thus, we included a series of questions to elicit the importance Mainers place on the potential benefits and concerns that may be associated with GM foods. Specifically, we provided respondents a list of 16 potential benefits and 16 potential concerns

TABLE 3: Average Importance Mainers Place on Potential Benefits of Genetically Modified Food*

| | |
|---|------|
| Decreased use of pesticides | 4.13 |
| Increased food production in lesser-developed countries | 3.83 |
| Decreased use of antibiotics | 3.68 |
| Decreased total fat/saturated fat | 3.67 |
| Lower food prices | 3.65 |
| Increased vitamins/minerals | 3.59 |
| Increased anti-oxidant levels | 3.54 |
| Increased disease resistance in crops | 3.51 |
| Increased protein in foods | 3.43 |
| Removal of allergens | 3.32 |
| Decreased need for irrigation | 3.30 |
| Longer shelf life | 3.29 |
| Increased flavor | 3.16 |
| Increased frost resistance | 3.07 |
| Foods modified to contain vaccines | 2.89 |
| Increased size of fruits/vegetables | 2.63 |

* where 1= not at all concerned, 3=somewhat concerned, and 5=very concerned

of using GM foods, and asked them to rate each one on how important the benefit or concern was to them.

To Mainers, the most important potential benefits of GM foods are: decreased use of pesticides, increased food production in lesser-developed countries, and decreased use of antibiotics (Table 3). This importance ranking parallels the ranking of concerns presented earlier (Table 2), which may indicate that Mainers would be amenable to GM foods if they could be assured that the genetic modification led to decreases in pesticide and antibiotic use. Of the top eight benefits, six can be considered to be benefits that accrue directly to the consumer through improved food characteristics. Most of these benefits relate, at least partially, to improvements in the health attributes of the food.

TABLE 4: Average Importance Mainers Place on Potential Concerns About Genetically Modified Food *

| | |
|---|------|
| Unknown long-term health effects | 4.44 |
| Increased risk of antibiotic-resistant bacteria | 4.41 |
| Increased use of pesticides | 4.29 |
| Unknown long-term environmental effects | 4.25 |
| Unknown toxins produced | 4.23 |
| Genetic contamination of the environment | 4.22 |
| Increased use of herbicides | 4.21 |
| Risks to wildlife and insects | 4.21 |
| Damage to topsoil | 4.00 |
| Spread of disease resistance to weeds | 3.99 |
| Unknown allergens introduced | 3.97 |
| Control of agriculture by biotech firms | 3.97 |
| Spread of pest resistance to weeds | 3.96 |
| Spread of herbicide tolerance to weeds | 3.94 |
| Risks to species diversity | 3.82 |
| Ethical issues | 3.61 |

* where 1 = not at all concerned, 3 = somewhat concerned, and 5 = very concerned

Farmer production benefits and improvements in other food attributes (e.g., size and taste) are less important to Mainers. Interestingly, currently approved GM foods primarily provide producer benefits with few benefits accruing directly to the consumer. However, one benefit that is of great importance to both farmers and consumers is the potential reduction in pesticide use.⁴

Pesticide reduction seems to be an actualized benefit of planting GM crops. According to the USDA (Fernandez-Cordejo and McBride 2002), increased plantings of these GM crops have led to an overall decrease in the amount of pesticides used, and in a

switch from more to less toxic pesticides. Seemingly, food producers using GM ingredients could have similar success in marketing pesticide reduction as a benefit to consumers. Ironically, one could argue that the current lack of labeling GM foods is hampering producers' ability to market these benefits to consumers.

To Mainers, the most important potential concerns of GM foods are: unknown long-term health effects, increased risk of developing antibiotic-resistant bacteria, and increased use of pesticides (Table 4). Again, the importance of antibiotic and pesticide use parallels the ranking of concerns and benefits presented earlier. Of the top eight important concerns, five can be considered to be concerns about risks that directly impact the consumer (through perceived increases in food safety risks); the rest are related to potential negative environmental impacts. An important component of all these top concerns seems to be the uncertainty of long-term impacts.

The high level of concern surrounding unknown long-term impacts is a consistent theme explaining consumers' negative reactions to new food technologies. For example, concerns about long-term health impacts seem to explain why American consumers initially opposed dairy pasteurization (Huffman 2004) and microwave ovens (Devlin 1998) although few individuals currently reject the benefits of these technologies. In addition, Levy and Derby (2000) indicate that, in general, consumers trust food scientists' abilities to determine the short-term safety of new food technologies but understand the limitations scientists face in determining long-term impacts. Interestingly, the level of technical knowledge about a new food technology does not seem to impact consumers' concerns. In focus group research comparing consumer reactions to food irradiation and pasteurization, Levy (2001) indicates that participants were equally unfamiliar with pasteurization and irradiation; however, irradiation was associated with heightened levels of concern. He concluded that lack of knowledge of the specifics of the technology is not what creates consumer uncertainty; it is the lack of experience with the technology. Pasteurization does not cause concerns because consumers knew that "it was widely used, had been used for a long time and they had never experienced

any problems or heard any questions raised about its safety or effectiveness. The key difference between pasteurization and irradiation, in the minds of participants, was that pasteurization had been vetted by widespread societal experience while irradiation had not” (Levy 2001: 9).

Referring back to the question posed in the last section, can labeling play an important role in this vetting process? If long-run uncertainties are the primary driver of consumer rejection of new food technologies then a lack of labeling may actually prevent consumers from having the ability to develop experience with it. That is, Mainers currently do not have the ability to understand the extent to which they consume GM foods without any apparent ill effects. Using Levy’s words, the lack of GM labeling may prevent society from vetting these foods.⁵ If GM food labeling had begun 10 years ago, one may presume that concern levels about the technology might be much lower today. This appears to present an ironic twist to those who support labeling as a way of eliminating GM foods; labeling of these foods may, after an initial brief decline in sales, actually lead to a broader long-run acceptance of the technology. This also presents a conundrum to those producers who fear labeling; they may be trading off a potential short-run decline in sales against future growth in sales by being able to increase consumers’ long-run confidence in the technology.

Mainers’ Views About GM Food Labeling

One question that the Maine Legislature has faced is whether GM foods should be tested and labeled. Before asking Mainers whether they wanted a GM food labeling program, we first want to determine to what extent Mainers have experienced GM food labeling. Currently, GM food labeling is not required and producers only test and label their foods to denote that they do not contain GM ingredients. Few Mainers (15%) have seen a food label stating the product did not contain genetically modified ingredients. However, almost all Mainers (87%) want GM foods to be labeled.

For those who want GM foods labeled we asked a follow-up question to determine how they wanted the program structured. As a part of the question we first

TABLE 5: Mainers’ Desire for Labeling Genetically Modified Foods

| | Percent Stating |
|---|-----------------|
| Want mandatory testing with all foods labeled | 38% |
| Want mandatory testing with only genetically modified foods labeled | 52% |
| Want mandatory testing with only foods not genetically modified labeled | 4% |
| Want voluntary testing with only foods not genetically modified labeled | 6% |

explained to respondents that there are several ways to implement a food labeling program:

A **mandatory** approach would require all food producers to test whether their product contains GM ingredients. Once tested, the program could require either:

- **all foods** to display whether they contain GM ingredients;
- **only foods** containing GM ingredients to display a label;
- **only foods not containing** GM ingredients to display a label.

A **voluntary** approach would allow food producers to voluntarily test whether their product contains GM ingredients. Once tested, the program would allow:

- **only foods not containing** GM ingredients to display a label.

Almost all Mainers who want labeling (94%) want this labeling to be mandatory (Table 5). Clearly, almost all Mainers are dissatisfied with the current approach of voluntarily labeling only those foods that are certified as free of GM ingredients. Interestingly, although most Mainers want food testing to be mandatory, a majority

TABLE 6: **Percent of Mainers Preferring Specific Groups to Oversee Labeling Program**

| | |
|-----------------------------------|------------|
| Government | 69% |
| Food and Drug Administration | 33 |
| U.S. Department of Agriculture | 33 |
| Environmental Protection Agency | 3 |
| Independent | 13% |
| Consumers Union | 8 |
| Union of Concerned Scientists | 5 |
| Identity Preservation Program | 0 |
| Genetic ID, Inc. | 0 |
| Health-related | 9% |
| National Institutes of Health | 6 |
| American Medical Association | 2 |
| American Cancer Society | 1 |
| American Heart Association | 0 |
| Environmental | 9% |
| Organic Consumers Association | 5 |
| Greenpeace | 3 |
| Natural Resources Defense Council | 1 |
| Other | 4% |

do not feel that all foods need to carry a label designating whether the food contains GM ingredients; most preferred that only foods containing GM ingredients display a label.

Although answers to the previous questions help to answer whether Mainers desire GM food labeling they provide only partial information about their preferences for how the program should be structured. Several important questions remain: first, who should be in charge of the labeling, and second, what types of information do consumers want to see on the label? To answer the first question, we presented survey respondents with a list of 14 different agencies and organizations and asked them to choose which one organization they would prefer to do the labeling.^{6,7} Government agencies are preferred by over two-thirds of Mainers; most of these individuals want either the U.S. Food and Drug Administration (FDA)

or the U.S. Department of Agriculture (USDA) to administer the labeling program (Table 6). Apparently, Mainers' familiarity with these two organizations and their positive evaluation of these organizations' traditional handling of food labeling (e.g., FDA's nutrition labeling and USDA's meat grading labels) helps to explain Mainers' strong desire for these two agencies.

Independent organizations are the second most preferred option. Of the four independent organizations, no Mainer chose the two that are currently the largest independent certifiers of GM-free foods (the Identity Preservation Program and Genetic ID). Although more than 10% of Mainers chose them, Consumers Union and the Union of Concerned Scientists do not propose to do any labeling of GM foods; they both endorse the idea that the FDA should institute a GM food labeling program.

It may be surprising that relatively few Mainers want a health or environmental organization to administer a GM food labeling program given their health-related concerns about GM technology. However, of the four health-related groups, the American Medical Association has stated that they find no scientific justification for the general labeling of GM foods (AMA 2000), and the other three have apparently not taken any official position on the labeling issue. Further, in earlier focus groups (Teisl et al. 2002), we found that one reason some people did not want health organizations to administer a GM food labeling program is that many of these organizations target only specific diseases/conditions (e.g., heart disease) whereas GM foods could potentially impact the whole body.

It is surprising that relatively few Mainers want environmental groups to administer a GM food labeling program, because at least two of these groups (the Organic Consumers Association and Greenpeace) have strongly supported GM food labeling or have campaigns supporting moratoriums on GM foods.⁸ In fact, the Organic Consumers Association (working with Co-op Voices Unite!, a volunteer committee of the Blue Hill Food Co-op, Blue Hill, Maine) has worked to support the original wording of Maine Legislative Bill 1219, "An Act to Create a Moratorium in the State of Maine on Genetic Crops." In addition, as stated earlier, Greenpeace has been relatively visible

TABLE 7: Importance Ratings of Potential Information Pieces for a Genetically Modified Food Label *

| Labels should list: | |
|---|------|
| Any warnings associated with the genetic modification | 4.60 |
| A phone number or Web site so you could obtain more information | 4.18 |
| Who is certifying the information | 4.16 |
| Which ingredients in a product are genetically modified | 4.00 |
| Any benefits associated with the genetic modification | 3.82 |
| How the ingredients are genetically modified | 3.33 |
| Why the ingredients are genetically modified | 3.22 |

* where 1= not at all concerned, 3=somewhat concerned, and 5=very concerned

in Maine by their protests of supermarkets selling GM foods. Mainers may not want these organizations to run a labeling program because Mainers make a clear distinction between an organization's ability to promote advocacy and their ability to administer and manage a food-labeling program

To help determine the types of information Mainers want to see on a GM food label, we asked Mainers to rate the importance of seven potential pieces of information that could be placed on such a label. Given Mainers' concerns about the potential health risks of GM foods, it is not surprising they place a high degree of importance on knowing about any warnings associated with the genetic modification (Table 7). Providing contact information (a phone number or Web site) or identifying the organization in charge of certifying the GM information are the next most important pieces of information. Mainers are likely to desire these pieces of information on the label because it would allow for a simpler, more credible label⁹ while also allowing more interested individuals a venue to pursue more information. In addition,

this information is particularly important because most consumers currently don't know much about GM foods and their effects. In addition to information about risks, Mainers also would like a GM food label to provide information about the benefits associated with the genetic modification.

The fact that Mainers desire GM food labels to provide benefit and risk information implies that a simple yes/no approach to GM food labeling (i.e., a label that solely provides information about whether the food contains GM ingredients) may be of limited usefulness to consumers. The use of biotechnology in food production can have multidimensional effects on product quality; for example, the genetic modification could alter nutritional content or the amount of pesticides used in food production. Some Maine consumers may want to know about some or all of the changes in product attributes brought about by the use of biotechnology; a simple declaration of whether a product contains GM food would not be helpful to these individuals. In fact, for some individuals (those who are concerned about GM content but who are willing to accept it if the genetic modification provides an associated benefit), a simple GM label would actually be harmful.¹⁰ The harm comes from the fact that a simple GM label would cause these individuals to avoid a food product they would otherwise be willing to consume if they were given information about the benefits of the modification.

CONCLUSIONS

The flow of information among market participants plays a critical role in the efficient operation of markets. In a broad sense, labeling and marketing have the ability to convert a market in which all goods feature an attribute that consumers can't observe into one in which consumers can. From a policy perspective, labeling allows consumers to make choices that match their personal preferences and may be implicated in helping society to accept new technologies. From a business perspective, labeling allows firms that use (or don't use) particular techniques to gain market share and maximize profit margins. In addition, if labeling helps expedite consumer acceptance of new



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technologies, then GM food labeling may, in the long run, assist producers that use this technology.

The benefits of product-specific labeling can be measured by its ability to inform consumers about a product's positive and negative attributes. Policies allowing consumers to make purchase decisions that match their personal preferences are inherently desirable, whether the attributes concern end-use characteristics (e.g., the consistency of flour used in baking) or process attributes (e.g., whether GM grain was used in making the flour)—as long as these policies are not too costly. Thus, there is no *a priori* reason for the Maine Legislature to resist implementation of a

labeling policy for GM foods. However, although the research indicates that most Mainers desire a labeling program for GM foods, it does not necessarily indicate that such a labeling program should be instituted because we did not consider the costs of instituting a labeling program.

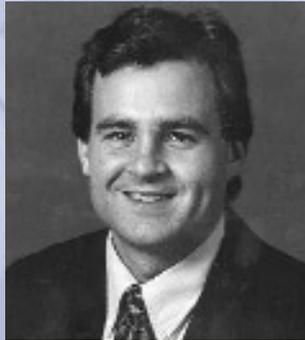
Instituting a labeling program for GM foods may have relatively large costs, which may differ significantly across types of programs (Teisl and Caswell 2002). Labeling programs require standard setting, private compliance and certification efforts, and public enforcement oversight. Other costs may include loss of food imports into the state,¹¹ litigation costs¹² and costs from the dilution of information already included on labels.¹³ Unfortunately, previous studies have provided a wide range of cost estimates for the imposition of GM food labeling; e.g., per-person cost increases can vary from \$0.23/year to \$48.00/year (Jaeger 2002). That the studies to date return differing estimates of the costs of GM food labeling is not at all surprising, given the differing sections of the food

supply studied, the different types of costs considered, and the different assumptions made in modeling costs.

A decision to impose a labeling program for GM foods should recognize both the benefits and costs of instituting the program. Unfortunately, no research currently measures and compares the various costs and benefits of alternative labeling approaches for GM foods. It is this limitation that precludes us from concluding that a labeling program should be instituted; rather, the findings can provide guidance on how a labeling program should look if it is determined that such a program is warranted.

In terms of the GM food debate, thus far one thing is relatively clear: a simple GM food label will be of limited usefulness to consumers because it would only allow consumers to differentiate GM food products from non-GM food products. Given that genetic engineering can produce a wide variety of “outcomes” (positive or negative), simple GM food labels are not likely to allow most Maine consumers to differentiate products in the manner they most desire. When making food choices, a consumer may want to know whether the GM food contains or removes allergens, contains increased levels of anti-oxidants, or was produced with fewer pesticides. A simple GM food label could actually hurt those Maine consumers who would be willing to accept GM food content when there are GM-linked benefits. Simple labels do not maximize potential benefits because, by not providing enough detail, they do not allow consumers to adequately rank competing products by key attributes. 🐞

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Michael E. Vayda is associate dean of the College of Agriculture and Life Sciences at the University of Vermont, associate director of the Vermont Agricultural Experiment Station, and a professor of botany at the University of Vermont. He conducted research in plant molecular biology at the University of Maine for 17 years, including work involving the use of transgenic potato plants. In Maine and Vermont, he has served as a liaison to stakeholder groups.

ENDNOTES

1. Maine aquaculture does not use GM salmon, but a European/American genetic hybrid (a conventional genetic cross).
2. The controversy wasn't about GM potato plantings per se; it was related to McCain's and McDonald's rejecting the use of GM potatoes, which led to the collapse of the potential Maine market for GM potatoes.
3. Not all irradiated food needs to be labeled, only those that are nutritionally altered by the irradiation.
4. To farmers, pesticide reduction is a benefit through reductions in production costs; to consumers, the benefit of pesticide reduction seems to be primarily driven by food safety concerns.
5. In earlier focus group research (Teisl et al. 2002), we found that when we told participants how much of the food supply is derived from GM crops, some found the information comforting; these participants combined the fact that GM foods are prevalent with the notion that they had not heard or known of anyone getting sick as positive news.
6. Because this survey was nationwide, we were unable to include on the list Maine-based organizations active in the GM debate.
7. Respondents also could have chosen to write in their own organization; listed as 'other' in Table 6.
8. For example, currently the Organic Consumers Association has a "Stop GM Wheat" campaign, a "Campaign to Stop GM Corn" and a campaign against Kraft foods use of GM ingredients—the "Genetically Kraft-ed Food" campaign.
9. Both pieces of information have been shown to be critical in establishing label credibility (Teisl forthcoming).
10. We find about 40% of Maine residents are willing to accept GM food content when associated benefits are present.
11. There is the potential that some firms may react to a GM food labeling requirement by deciding not to sell foods in Maine.

12. For example, the state may face litigation from federal food agencies or from private industry to determine who has jurisdiction over food labeling.
13. Increasing the amount of information on a label may actually decrease consumers' ability to process other, more important label information (Roe, Levy, and Derby 1999). In addition, requiring specific information to be placed on a label imposes a cost in that the limited space on the label could have been devoted to other, potentially more useful information. For example, when asked which one piece of information should be added to food labels, almost twice as many Americans say they would rather have information about pesticide residues than about GM foods (CSPI 2001).

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